The Green-Green Dilemma
Reconciling the conflict between Renewable Energy and Biodiversity

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ABSTRACT

With the steady aggravation of the climate crisis, the agenda of climate change has become a central preoccupation of governments across the world. The urgent need to drastically reduce dependence on fossil fuels by transitioning to renewable energy sources was globally recognized as a crucial step to control emissions. The European Union, with its robust legal framework under the Renewable Energy Directive of 2009 and its ambitious 2020 target, played an exemplary role in building consensus on the need to adopt alternate energy sources. However, as member nations of the EU seek to pursue their individual 2020 targets by harnessing greater "green" energy potential, an increasing number of such projects are being sanctioned in areas protected under the Birds and Habitats Directives, demonstrating an emerging conflict between renewable energy policies and biodiversity conservation in the EU. In this paper, the contradiction manifesting between renewable energy and biodiversity policies is examined through illustrative cases of renewable energy developments, with a particular focus on hydro and wind power projects undertaken by the member nations of the EU. It argues for a need to adopt a cohesive approach towards the twin environmental concerns of climate change and biodiversity. The paper attempts to initiate critical discussion on how the goals of green energy transition may be aligned with the targets of biodiversity conservation without one environmental issue overriding the other.

Key words: renewable energy; biodiversity; policies; law.

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Introduction

The 2015 declaration under the Paris Agreement to limit global warming to 1.5 degrees Celsius above pre-industrial levels, brought the issue of unsustainability of current energy resources to the forefront. Identifying fossil fuels as the key driver of climate change [1], reducing carbon emissions has decisively constituted the core of mitigation and adaptation strategies proposed under the International climate framework proposed at Paris [2]. Under the aegis of this global consensus, energy efficiency emerged as primary course of action to envisage a transition from carbon-intensive economies to renewable or "green" economies [3]. The years following this historical agreement saw its member nations across the world drawing up ambitious energy transition targets to be achieved by 2020 when the Agreement is set to come into operation. True to their commitments, more than 50% of the member nations' Nationally Determined Contributions (NDCs) reflect renewable energy targets. Achieving a 100% renewable energy transition echoed in the pledges of major cities across the world.

In the European Union, the thrust towards energy transition occurred in a significant way with the introduction of the Renewable Energy Directive (RE Directive) which bound its member nations to undertake mandatory targets to be achieved by 2020 [4]. It set a binding target of 20% final energy consumption from renewable energy sources on all the member nations by 2020 and 27% by 2030 [4,5]. The enactment of the RE Directive served as a fitting precursor to two major political shifts announced by the EU Commission in 2015- one pertaining to the merger of the hitherto distinct commissioner portfolios of climate action and energy, and the other pertaining to the announcement of the Energy Union. With the purported goal of transitioning "to a low carbon, secure and competent EU economy," the above announcements of the new Commission symbolically redefined climate change as primarily an energy concern [6,7]. Thus, with a robust regulatory framework and an accompanying political will in place, EU countries began their race to exploit and harness greater renewable potential towards achieving their respective goals of decarbonization.

However, in this race, they remain inattentive to a crucial aspect of renewable energy, that is, its inextricable relationship with biodiversity [3]. The discourse of "green economy", that gained immense traction in the international environmental debate since the Rio+20 Conference, despite its endorsement of "investing in natural capital and increasing energy efficiency", neglected a vital third pillar of biodiversity, which began to bear a disproportionate brunt of this expansion [8].

In the context of a rapidly increasing relevance of renewable energies in future energy scenarios, this paper aims at unraveling the insufficiently examined link between renewable energy and biodiversity. Examining the negative impact of certain renewable energy pathways on biodiversity and ecosystem services, this paper argues for a need to adopt a cohesive approach towards the twin environmental concerns of climate change and biodiversity. It argues that a critical step in this direction is to adapt the existing policy and legal frameworks of renewable energy and biodiversity protection to one another. Organized in broadly three parts, the first section introduces the renewable energy and biodiversity legal frameworks of the EU, with a view to understand the parallel operation of the two legal mechanisms at the supranational level, highlighting areas of overlap or conflict between them; the second section examines reported case studies illustrating biodiversity impacts caused by hydro and wind energy projects undertaken in the last decade in various parts of the EU drawing attention to the factors that pose risks of severely depleting or altering ecosystem relations; the final section locates these negative impacts in the context of the incongruity between legal frameworks of renewable energy and biodiversity discussed in the first section with the aim of identifying procedural lapses and knowledge or research gaps which expedite such an antithetical interaction between renewable energy and biodiversity and concludes with suggestions for integrating biodiversity concerns in the vision of energy transition.

The objective of this review is not to apprehend energy trends espoused by the green economy narrative, but to address the underlying conflict between two critical components of its vision of energy transition. In doing so, it hopes to contribute to legal reform and raise questions for further research regarding the possibility of developing renewable energy pathways that are reconciled with biodiversity.

Policy and legal Framework

Climate change and biodiversity depletion have both been recognized and addressed as problems of global scale and magnitude at the international level [2]. Global consensus on the gravity of these issues and the need for immediate action was expressed in the form of two major international framework conventions- the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention on Biodiversity (CBD). Building on its commitments to the declarations within the above conventions, the EU sought to adopt them by enacting legal regimes of climate change and biodiversity accordingly. The gamut of legislation and policies that emerged therefrom will be outlined and examined below.

Climate Policy and Legal Framework

The UNFCCC which entered into force in 1994 is the international framework legislation directed at climate action [9]. It oversees its implementation through its supreme decision-making body known as the Conference of Parties (COP) which meets annually, attended by representatives of member nations party to the Convention, deliberating and passing motions on various aspects of the Climate Agreement. At the 15th session of the COP held in Copenhagen, the Parties undertook the goal of submitting GHG emission-reduction targets for 2020 [10]. Accordingly, the EU committed itself to a target of 20% reduction of GHG emissions by 2020 [11]. In order to achieve the same, reduction of dependence on fossil fuels by moving to renewable energy sources was seen as a complementary step to mitigation by the EU.

Reaffirming this commitment, the RE Directive was enacted in 2009 with the goal of contributing 20% share of renewables by 2020 and enjoining the member nations to commit to mandatory goals towards achieving the EU target of 20% by 2020 [11]. The Directive served as a legal basis for catalyzing massive financial support for innovation and development of low-carbon technologies through programmes such as the NER300 and Horizon 2020. Coupled with support schemes such as feed-in-tariffs, tax credits, grants and tenders that have driven down prices of renewables and boosted their competitiveness, the EU has ensured a steady rise in the installed capacity of renewables in heating and electricity sectors over the last decade [12]. Thus, the EU developed a formidable mechanism to deliver its international commitments, through strategy documents such as the Europe 20-20 Strategy and the Framework Strategy for a Resilient Energy Union, 2015, followed by a host of policy instruments such as the EU-ETS and Efforts Sharing Decision (ESD) to support the member nations in implementing the energy and climate legal framework, comprising of the RE Directive, the Energy Efficiency Directive, the Fuels Directive.

As a consequence, the share of renewable energy to total energy consumption in the EU nearly doubled since 2004, rising to 17% in 2016 and sustained its growth, reaching 17.4% in 2017 [13]. Electricity from off-shore wind turbines and solar installations became increasingly competitive while enormous unexplored hydropower potential in the south-east

European region was discovered, just as large-scale cultivation of energy crops and technology to capture geothermal energy began to proliferate.

As the member countries began to take stock and gauge the most exploitable sources of renewable energy at their disposal, given their differently-endowed potential, natural ecosystems across the continent came under increasing pressure. Aimed at replicating the magnitude of fossil fuel energy supply through their transition goals, member countries began to encroach upon protected territories. This is where renewable energy targets came into loggerheads with the environmental protection regime of the EU which will be examined in detail below.

Biodiversity Policy and Legal Framework:

At the international level, the UN CBD signed in 1992 serves as the framework for biodiversity conservation with its avowed goal of significantly reducing the rate of biodiversity depletion in the world [14]. In its commitment to the CBD, the EU Commission adopted an ambitious 2020 target to halt biodiversity loss and ensure the resilience of ecosystems and secure their variety of plant life [15].

On the basis of this international framework, a legal regime for biodiversity protection was implemented by enacting the Habitats Directive in 1992 [16] and the Birds Directive in 2009 [17]. The Natura 2000 Network was established in 1992 comprising of a network of designated Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) governed today under the Birds and Habitats Directives (Article 3(1) of the Habitats Directive) [16].

Within the above legal framework, Article 6(3) and Article 12 under the Habitats Directive and Article 5 of the Birds Directive form the crux of the protection regime detailed above and are therefore the most invoked provisions therein. Article 6(3) stipulates that new projects may be sanctioned in Natura 2000 only if the projects are proven to not have any "lasting adverse effects on integrity" of the protected sites, and only if there is scientific evidence contrary to such adverse impacts, beyond reasonable doubt. Such evidence may be evinced through environmental impact assessments of the proposed project on the site. Article 12 of the Habitats Directive lays down rules for animals in need of strict protection. Article 5 of the Birds Directive offers the same protection in the context of naturally occurring bird species in the wild by prohibiting "deliberate disturbance" to their nesting sites and breeding and rearing activity. The Water Framework Directive is also a crucial ecological protection legislation with the objective of achieving a predefined 'good' status of all water bodies by 2015 and further, to prevent the deterioration of any water body (Article 4(1), Water Framework Directive) [18].

Currently, the Natura 2000 areas cover about 17.5% of the EU land area with significant additional marine areas. Complementing the above regulatory framework, the EU also ratified in 1982, the Bern Convention of Conservation of European Wildlife and Natural Habitats, 1979 (the Bern Convention) [16], a legally binding convention on nature conservation. Towards implementing it, the Council of Europe launched the Emerald Network in 1989 connecting all the areas of special conservation interest under the Bern Convention. The network operates alongside the Natura 2000 network.

In addition to the biodiversity regime, the legal framework dealing with the renewable energy projects also confronts the Environmental Impact Assessment Directive [19], and the Strategic Impact Assessment Directive [20]. These directives aim to ensure that plans, programs and projects likely to have significant effects on the environment are considered for environmental assessment, prior to their approval and implementation. They require developers to produce an environmental impact assessment report framing measures that would avoid, reduce and offset significant adverse effects.

Biodiversity and Renewable Energy- An Incongruous Overlap

From a glimpse into the energy and environmental legal frameworks outlined above, it is possible to foresee the inevitable conflict arising between the definitive thrust to renewable energy projects given by powerful climate action strategies on the one hand, and the irrefutable environmental protection framework set in place by the biodiversity legal regime.

In his comprehensive essay on large-scale water-based renewable energy projects, Sander van Hees accurately identifies and documents two major areas of conflict between the biodiversity and energy policies in the EU. The primary point of contention, he states, is the conflict between the objective of nature conservation, that is protection of designated areas from negative impacts on the one hand, and the objective of the energy directive, that is to expand and sanction increasing number of projects in these areas to achieve the 2020 targets, on the other hand. The second point of conflict between the regimes, according to van Hees, and perhaps also indicative of the first one, is the lack of integration between the biodiversity and renewable energy directives in the EU [21].

The conflicts outlined above may be attributed to two characteristic traits of renewable energy projects and the biodiversity framework, which are, scientific uncertainty and derogation clauses respectively. Each of them may be understood in turn as follows.

The execution strategy of the protection regime under the biodiversity framework, as gleaned from the provisions discussed above, depends on the certainty of the impact assessment of the project in view of the conservation objectives set for the particular site. However, given that the renewable energy sector is still in its nascent stages of innovation and deployment, there are significant gaps in the knowledge of their environmental impacts. The following section will examine this problem through examples. Therefore, the condition of scientific certainty which is inherently problematic for new, emerging renewable energy projects results in a fundamental conflict between the two regimes.

The derogation clauses within the biodiversity framework provide a legal basis for Member nations to derogate from the protection clauses outlines above- Article 6(3), Article 12 of the Habitats Directive and Article 5 of the Birds Directive. Residing in Articles 6(4) and 16 of the Habitats Directive and Article 9 of the Birds Directive, these clauses allow projects proven to have a prohibited impact on the protected areas under Natura 2000 in the interest of public health, safety and protection of flora and fauna. However, the provision also lays down specific conditions to be fulfilled in order for the clauses to be invoked. Lack of alternative solutions is a condition common to the clauses in both directives while the Habitats Directive has an additional requirement of "compensatory measures" under Article 6(4). A similar derogation clause also exists under the Water Framework Directive under Article 4(7) [18]. Recent times have seen an emerging trend of derogation clauses being invoked to facilitate an increasing number of renewable energy projects in protected areas. The following section will examine this trend through illustrative cases.

Impact of Hydropower on Biodiversity

The growth in the share of renewables in electricity generation in the EU between 2005 and 2015 could be attributed in major part to hydropower which continues to be the single largest source of renewable electricity generation in 2015 [22]. With ambitious renewable energy goals several member nations have begun to heavily invest in harnessing untapped renewable energy potential in their regions.

Hydropower has a transformative impact on terrestrial and maritime ecosystems, both upstream and downstream. Most ecological and social impacts of hydropower projects are seen to occur across the construction and operation phases of these projects. The land and infrastructure-intensive construction phase which involves laying roads, erecting dams, reservoirs, connecting transmission lines indicate an enormous pressure on the surrounding environment. In their operation phase, the dams- depending on their type significantly alter the hydrological patterns of rivers, implying a great deal of intervention in ecological and social systems dependent on them. Given the massive scale of these projects, it is obvious that the implications of inadequate or improper planning could be catastrophic. Some of these impacts include lowering of groundwater levels and drying up of wetlands suspended solid structures in the river, alteration of water temperatures downstream, thereby impacting the biological life, impact on habitats such as alluvial channels, riffles etc., on the migration of species [23].

From a sense of the high-stakes impact of large hydropower project it is expected that they would squarely fall within the category of projects prohibited under Article 6(3), Article 12 of the Habitats Directive and Article 5 of the Birds Directive. However, this was found not to be the case in several projects that were challenged for their devastating ecological impact.

The Kaunertal Extension Project planned in the pristine Alpine valley across Austria and Italy is one such undertaking. Involving a 120-meter-high embankment, the proposed project would impact the rare alpine grasslands which are protected under the Habitats Directive. The impact assessment of the dam also proved significant on the Ötztal Alps Wilderness Area, affecting the Natura 2000 site of "Ötztaler Alpen". Pending the outcome of discussions on the impact assessment of the extension project, the European Commission has already listed the project as one of the key energy infrastructure projects of EU [24,25].

The case of the hydropower dam on Schwarze Sulm river sanctioned by the Austrian Government pertained to the question of invoking the derogation clause under the Water Framework Directive [18]. While the project was located in a Natura 2000 site, the particular point of contention raised before the European Court of Justice, by the European Commission was regarding the failure of the Austria as an EU member, in complying with the Water Framework Directive by allowing deterioration of water quality. Although the project was temporarily halted, the Court decreed in favor of the Government as the Commission failed to prove infringement [26].

Another noteworthy case involving derogation is the Portuguese Government's undertaking of a major power project in the Sabor Valley of Portugal. Despite the site comprising of two SPAs under the Natura 2000 network, the Government invoked the derogation clause under Article 6(4) of the Habitats Directive. Despite the presence of an alternative site with relative minimal impact in the Côa valley in addition to several other potential sites, the Government was insistent on the Sabor Dam given its hydroelectricity drive to reach its energy targets for 2020. It started a National Dam Programme in 2010 with the same intention [27]. The European Commission set aside the infringement proceedings against the Sabor Dam in 2007, accepting all the conditions under Article 6(4), including the compensatory measures proposed by the Government although they were against the Commission's own guidelines [27].

The derogation clause has proved time and again, an effective outlet to Governments and investors to evade the stringent protection framework. A comprehensive study undertaken by the NGOs Euronatur and Riverwatch in the Balkan region, examines the impact of 2800 hydropower projects set to be undertaken over the coming decade on its largest and oldest free-flowing river system [28]. A quarter of the large hydropower projects that were assessed were found to be located in protected areas such as the Natura 2000 Network, Ramsar Sites, Emerald Network and World Heritage sites. This trend is problematic as hydropower projects are being funded on a priority basis by Governments to increase their contribution to the share of renewables. With the EU's support to foster an integrated energy market across regions and increased investment from multilateral development banks such as the EBRD and the World Bank, it its likely to get more difficult to challenge the feasibility of such projects or to expect an unbiased impact assessment from project developers [29].

The continuing struggle of countries like Romania and Slovenia to protect their free-flowing river system is illustrative of this point. In Romania, two major hydroelectric projects were planned on the River Jiu which violated the Natura 2000, Birds, Habitats and Water Framework Directives [30,31,32]. Despite the ruling of the Bucharest Appeal Court to permanently cancel construction permits and recommence the process of obtaining permits, the construction company Hidroelectrica, due to its powerful allies on the ground remains undeterred [31,32]. Similarly, in Slovenia, ceaseless attempts of environmental activists and NGOs are ongoing to oppose eight dams proposed to be undertaken by the Government on the Mura river. The Government is now considering halting the projects in light of the severe backlash [35,36].

Impact of Offshore Wind Farms on Biodiversity

The offshore wind market is developing at a rapid pace, according to a report from the European Wind Energy Association (2014) [37], and as the technologies mature, and valuable experience is gained from the projects that have been implemented, the offshore wind industry is planning bigger farms in deeper water further from shore than ever before. As offshore wind turbines are currently being installed directly on the seabed, it is important to consider the potential environmental impacts on benthic communities [38].

Implementation of the many and increasingly widely spread plans [39,40,41,42] for offshore wind farms inevitably means major changes in marine habitats and species, as they involve an entirely novel use of the seas, these large-scale plans bring with them not just technical challenges, but as-yet poorly understood impacts on the natural environment.

The cumulative impacts of numerous wind farms are especially hard to estimate and, so far have only been assessed based on forecasts [43]. These impacts can be categorized into two phases, the construction phase, which includes pile-driving noise, noise from shipping, sediment shifting or overbuilding and the operation phase, which includes impacts as overbuilding/introduced hard substrates, collision risk and barrier effect and shipping and aviation.

The work made in the construction phase for the foundation of an offshore wind farm starts with pile driving, which generates a huge amount of noise. When installing the foundations, which can weigh over 1,000 tons, there is a direct effect on the sea floor, which includes the destruction and permanent overbuilding of benthic communities and possibly of protected habitats [44].

The pile driving noise generated in construction of wind turbine foundations is well above the tolerance limits identified by scientists [45] for these animals and can cause temporary hearing impairment and thus a massive hindrance to food seeking or even severe injury. At greater distances – up to 20 km or more for pile driving without noise mitigation – the sound pulses trigger stress and behavioral responses that often cause the animals to flee their home grounds [46,47]. Underwater noise can also drown out acoustic communication between porpoises, interfering with their orientation and ability to find prey [48].

Transporting components and laying cables also increase shipping traffic between the construction site and the mainland, as studies have shown [49]. Electromagnetic fields and heat given off by power cables leading onshore from wind farms have the potential to harm mussels, worms, electrosensitive cartilaginous fish such as sharks and rays, and bony fish such as eels [50,51].

With regards to the operation phase, the foundation for wind turbines and in some cases, very extensive measures used to secure them, result in permanent overbuilding and the destruction of benthic communities [52,53,54].

There is ongoing debate about the possible ecosystem impacts of wind turbine foundations and their scour prevention structures, which have the effect of artificial reefs [55]. Studies on the Alpha Ventus test site showed a local increase in diversity due to growth on wind turbine foundations [56]. In the North Sea especially, which is dominated by soft sediment and associated benthic communities, the foundations and scour prevention structures create artificial surfaces for colonization by hard substrate species that do not occur naturally at all in these locations [57]. So far, however, there has evidently been no colonization by species not native to the German North Sea, meaning that the increase in diversity is indeed only local. It is not yet possible to predict the long-term effects of this change in natural local ecological communities as a result of large-scale wind farms.

Further research is still needed however, notably into the impacts of underwater noise from wind turbines on the marine natural environment together with potential noise mitigation measures, into seabird habitat loss as a result of wind turbines, and into the cumulative effects of wind farms.

Differences between the assessments of the impacts collected in the EIA reports and those listed in the grey and scientific literature can be noticed. A study assessing multiple EIA reports all over Europe [58] showed that they tend to be less alarming than grey and scientific literature and one reason for this can be that developers tend to highlight the positive effect of offshore wind farms for strategic reasons, while the grey and scientific literature does seem to be more alarming, here the negative impacts are more emphasized.

Generally, marine biodiversity is being taken into account, but to a limited extent, through an incomplete implementation of the mitigation hierarchy—as long as it is acknowledged that there is something problematic about the claim that offshore wind farm development has no environmental residual impacts with ecological risks [59].

Discussion

Renewable energy is as critical to the debate on mitigating climate change as it is to the discussion on resource depletion and biodiversity loss. This paper attempted to bring to the foreground an evident mismatch between importance given to climate change and biodiversity concerns in the overwhelming response of the EU nations to a green economy transition. While upholding the goal of such a transition, the paper argued that alongside multiplying production levels of renewable energy to mitigate emissions, it is crucial to foster solutions that sustain ecosystems and biodiversity well into the future.

The paper began with a scrutiny of the policy and legislative framework for renewable energy and biodiversity protection in the EU. Through a review of the dissonance between renewable energy and biodiversity directives, the authors identified the conditions to invoking derogation clauses under biodiversity protection directives as a potential check against problematic energy projects, however, they highlight the inherent weakness of the conditions, due to the factor of uncertainty in proving impact of an renewable energy project at the early stages of planning and implementation. Through this section, the authors conclude that a powerful protection framework will remain largely ineffectual in the presence of clauses that vitiate its impact, and renewable energy projects present ample opportunity for this grey area to be exploited.

The paper then proceeded to illustrate the conflict arising between renewable energy and biodiversity objectives through recorded case studies from hydropower and offshore wind power projects. Drawing on accounts of several major contested hydropower projects across the EU, the authors drew attention to the trend of invoking derogation clauses to seek exception for projects that were clearly within protected area sites with demonstrable ecological harm. In each case, emphasis was laid on the logic of cost-benefit analysis in determining the fate of a protected natural reserve. The immense difficulty in challenging these projects is in a way attributed to huge amounts of financial support and the complicity of the state in sanctioning projects to reach their projected renewable energy targets.

The challenge for compliance with the protection directives in the context of hydropower was found to lie in the difficulty in opposing exceptions to prohibition invoked by project developers, such as public necessity and lack of alternatives. However, in the case of offshore wind power, the difficulty stemmed from a lack of scientific certainty on the exact nature of implications of the project on marine fauna. These knowledge gaps were found to hamper the effective assessment of impacts and the issuing of some construction and operational permits. From this section, the authors attempted to show that increasing encroachment of protected areas by renewable energy is inevitable given the sheer number of projects that are in the pipeline, in addition to a number of existing projects that are already within protected areas. Through this, they vindicate their assertion of the need to synchronize and adapt the two frameworks of regulation. They conclude that this can only be possible by shedding the fragmented approach perpetuated by policies shaped by larger political decisions, such as the creation of the Energy Union.

Concluding Remarks

Having demonstrated the incongruity between renewable energy and biodiversity in the context of their regulation, the authors conclude the review with a discussion of suggestive measures to align the two deeply intertwined environmental concerns.

To begin with the current legal framework, a coordination between both sets of directives may be made possible by mainstreaming biodiversity concerns into the Renewable Energy Directive framework. This may be done by developing detailed sustainability criteria for renewable energy projects informed by knowledge of impacts unique to each source of renewable energy. Further, the biodiversity protection directives must develop standards to assess impacts of renewable energy projects within their scope of certainty. In this regard, continued and enhanced monitoring of carefully selected environmental parameters during construction and operation of renewable energy projects will in time generate more reliable data on both the adverse and potentially positive effects they have.

Uncertainty about predicting consequences also increases with the scale of the developments, in terms of both the size and number of installations. Ongoing monitoring will be crucial to identify how successful previous mitigation strategies have been in avoiding or reducing impacts on the environment. Future decisions can integrate new findings and mitigate new threats. Reassessing impacts of authorized renewable energy developments ex-post impacts that could have not been foreseen or estimated during the environmental impact assessment process and continuously updating the measures with good faith and thus giving effect to the precautionary principle could help in putting both green areas on an equal position.

Continuously integrating the knowledge gained from the results of developments can be done not only by the authorities and developers, but also by the scientific community and academia. They might commit to undertaking research on potential impacts of emerging innovations of renewable energy pathways and therefore contribute by providing scientifically-sound advice on the existing knowledge and by discussing and presenting some innovative approaches and tools to deal with the challenges of the integrating biodiversity policies with renewable energy policies together.

Reiterating the caution raised in the introductory section, the authors clarify that the purpose of this review is not to discourage the further development of renewable energy in the detriment of biodiversity, but to address the underlying conflict between two critical components of the vision that the European Union has with regards to its environmental future. Through the above suggestive measures and remarks, the review hopes to raise questions for further research that explores possibilities of developing renewable energy pathways that are reconciled with biodiversity.

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